

REMARKS

I. CLAIM CHANGES

The color simulation system claims have been amended to limit them to a hair color simulation system for simulating a hair coloring operation in which different hair coloring preparations that provide different hair colors when applied individually to the hair are mixed with each other and the hair is dyed with the mixture. The basis for this change in the claims is found on page 2, e.g. lines 7 to 10, of the applicant's claimed invention. The simulation system allows the hair styling professional in consultation with the client to accurately determine the mixture ratio for the two different hair color preparations that will provide the client with a hair color that is closest to that desired by the client.

In addition, some changes were made in the wording of claims 1 to 5 to provide strict antecedent basis for claim terms to provide a solid basis for claim construction arguments. For example, the term "the predetermined display area" in lines 3 to 4 of claim 1 did not have antecedent basis in the claim. The terms "the third layer" and "the fourth layer" in the next-to-last paragraph of claim 1 did not have antecedent basis in claim 1. The transparencies for the displayed colors of the two hair color preparations are not necessarily the same and are varied during the consultation according to the mixture ratio.

Some other changes were made to comply with the requirement to provide antecedent basis for claim terminology.

Also when a color is specified using the RGB color model three different values are used not a single value or parameter. The three different values specify the respective amounts of red, green, and blue primary colors that are mixed to obtain the displayed color. Thus the term “RGB value” has been changed to “RGB values” when it appeared in claim 1.

Claim 4 was amended to change the term “ration” at the end of claim 4, which appears to be a typographical error, to “ratio”.

The term “a hair” in claim 5 is believed to be incorrect or misleading because “a hair” generally refers to a hair strand. The wording of claim 5 was amended accordingly. Also the term “is” was changed to “represents” because the display area is not actually the head hair, but only represents the head hair.

II. SPECIFICATION CHANGES

The section headings on page 1 of the specification did not conform to the recommendations according to rule 77. The specification headings were changed accordingly. The heading “Description of the Related Art” was added.

A cross-reference that refers to the International Stage application and the priority document has been added.

III. OBVIOUSNESS REJECTION

Claims 1 to 5 were rejected as obvious under 35 U.S.C. 103 (a) over Salta (US '565), in view of Hamburg (US '583), in view of Fertig (US '689), and further in view of Yoshio (US '306).

The relationship of the claimed hair color simulation system to the combined disclosures of the aforesaid prior art references is considered in the following according to the principles set forth in M.P.E.P. 2141 and following, which are based on *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), as modified by the recent Supreme Court decision in *KSR*, 82 USPQ 2d at 1391.

A. SCOPE AND CONTENT OF THE PRIOR ART

Salta discloses a hair color simulation system including a processor, a memory, and a monitor with a display screen (column 2, lines 50 to 67). The processor receives and stores a digital color image of the hair styling professional's client, who wants to undergo a change of hair color by a hair coloring procedure, preferably taken with a digital camera (column 3, lines 1 to 25). The color image is displayed on the display screen (column 3, lines 25 to 30). The processor includes software that manipulates the color image by masking the area that does not include hair or anti-masking the area that

includes the hair and then changes the color of the hair area by means of standard or special photo processing techniques (column 4, lines 29 to 37). The color of the hair area is varied by the processor until the client finds the color that is closest to the desired hair color.

Saita also teaches that it is preferable to simultaneously display a plurality of simulated hair images in a plurality of different hair color shades on the display screen, so that the client can rapidly select the hair color that most closely fits the color that he or she wants (column 4, lines 53 to 67).

Saita also teaches in the last paragraph of column 4 that once the hair color for the coloring procedure has been selected by the client, the selected hair color can be input to the processor and a dye preparation that produces that hair color during a coloring treatment is selected by the processor from a previously stored data base (claims 18, 19, 24, and 25 of Saita). The name and/or composition of the dye preparation can then be output so that the hair coloring professional can proceed with the hair coloring procedure using the selected color preparation.

However Saita is completely silent regarding providing the color simulation system with processor means for superimposing two different hair colors with predetermined transparencies corresponding to an input mixture ratio of the hair coloring preparations that provide the hair colors so as to display the result of coloring the hair with a mixture of the two hair color preparations in the input mixture ratio.

Fertig also discloses a hair color simulation system including a camera 12 that acquires successive color images of the client and a computer 13 including an input device, memory and monitor (figs. 1 and 2, and paragraph 0013). In contrast to Saita, Fertig teaches acquiring the color images of the client in real time with a video camera that is connected with the computer to input the real time images of the client including the client's hair.

In operation the client faces the digital camera and turns his or her head to different angles as if looking in a mirror and can view their appearance in the display screen of the monitor. The processor performs the necessary masking or anti-masking to isolate the region of the images in which the hair is present and then changes the hair color of that region according to an input color selected by the client or the hair styling professional. As a result the client can view their appearance with the selected new hair color in the display screen from the different angles as they turn or turned their head in front of the video camera. This method of hair color simulation is advantageous because the client can make a better selection of hair colors when they can view their hair with the different possible colors at different angles in a virtual mirror.

However neither Fertig nor Saita disclose a hair color simulation system with processor means for superimposing two different hair colors with different transparencies, which are varied according to input mixture ratios of the hair coloring preparations that individually provide the two different hair colors, so as to display the result of coloring the hair with the mixture of the two hair color preparations in different mixture ratios on the display area of a display section.

In contrast to the systems of Fertig and Saita the applicant's claimed system according to the amended claim 1 allows the hair styling professional to determine the mixture ratio of two different hair color preparations that will produce a hair color that is closest to a hair color that is desired by a client when the mixture with the determined mixture ratio is used in a hair coloring procedure to color the clients' hair.

Hamburg does disclose an image processing method implemented using software in a computer 122 with a monitor 130 and input devices 132 (fig. 12). The resultant displayed image is obtained by superimposing a plurality of images layers arranged in a layer stack each having a predetermined opacity (equivalent to applicant's transparency). See column 1, lines 19 to 35. Use of masks to mask regions of the image is optional. Hamburg also teaches that colors of the different image layers may be blended to produce a resultant image color in column 2, lines 54 to 64.

However Hamburg does **not** disclose the application of their image layering techniques to hair color simulation systems. Hamburg does not teach that different compositions of paints or hair coloring preparations are correlated with individual different colors, so that the color simulation system may determine a mixture ratio for two different paints or hair color preparations that corresponds to a displayed resultant color that results from superimposing two different image layers having respective individual different colors.

In summary, Hamburg teaches nothing regarding hair color simulation systems that simulate hair colors resulting from dyeing with mixtures of hair dye preparations at predetermined mixture ratios.

Yoshio discloses a digital method for drawing and printing color sketches or images (fig. 2, column 3, lines 6 to 15), e.g. cartoons. The method can be applied to edit digital color photos by changing their brightness and contrast as well as colors.

The method of Yoshio is based on the RGB method of producing a given color shade or tone, in which an individual color is described by a triplet or vector of three values that defines the relative intensities of red (R), green (G), and blue (B) (the primary colors) that are combined to make the color.

In prior art method of changing the color of a digital photograph region or drawing it was necessary to set the three different color parameters for R, G, and B to set the color of the photo or drawing or sample image that was displayed on a display area (see fig. 8 and column 1, lines 19 to 33). This method was cumbersome because it was difficult to adjust three parameters to find the desired color by trial and error.

Yoshio improves this prior art method by displaying a color map, i.e. a two dimensional area on a display screen, that shows all possible color shades resulting from all possible combinations of the three values R, G, and B, i.e. all possible combinations of the three primary colors. The user designates a position on the color map, e.g. by clicking with a mouse at the position of the desired

color on the color map or by moving a thumbnail image to the position on the color map, in order to select the color for the photo or drawing from the color map (see claims 1 and 8, figs. 5 and 2 and 3, column 4, lines 6 to 37). Then the processor or device changes the colors of the thumbnail image according to the position selected on the color map.

The method of Yoshio is also used to select overall contrast and brightness of the photo or drawing (see fig. 5), as well as the overall color of the drawing.

However in the method of Yoshio only a single R, G, and B vector or triplet is selected by the user, which corresponds to an overall background color for the drawing or photo. Yoshio does **not** disclose that the input device 5 shown in fig. 2 inputs **a mixing ratio** that defines the extent to which two different colors, which are characterized by two different R, G, and B vectors or triplets, are mixed with each other. In applicant's color simulation system the R values of the two different colors, the G values of the two different colors, and the B values of the different colors must be averaged in a weighted manner according to their respective transparencies that are a function of the input mixture ratio.

Since no mixing ratio of two different colors is input in the color simulation system of Yoshio one cannot determine the mixing ratio of two hair coloring preparations by finding varying a single mixing ratio parameter with a single slider 24 as shown in applicant's figure 2. The simplest embodiment of the system of Yoshio includes **two** sliders for defining the single background color

variation and is shown in fig. 5. The embodiment of fig. 3 has eight buttons or touch screen positions for changing the color shade of the thumbnail.

Thus in contrast to the description on page 5 of the Office Action Yoshio does **not** display a single color that results from combining two different colors by superposition with transparencies that are determined by inputting a single color mixing ratio. Instead at least two different color parameters, such as G and B, are varied and input as shown in fig. 5 by sliders.

Briefly Yoshio does **not** disclose a color simulation system in which two different colors are mixed according to transparencies set by a single mixing ratio. Consequently there is no way to determine a mixing ratio that controls the amounts of two different preparations for producing individual colors that are necessary to produce a given color shade.

Furthermore Yoshio does **not** disclose application of their method for simulating hair colors that result from hair coloring procedures using hair color preparations. Yoshio does **not** disclose a system or device that includes a “hair color preparation data storage section” because such a section should include data that at least correlates particular hair color preparations with identifiers that could be as simple as numbers with the individual color shades that are produced by the hair color preparations.

B. RATIONALE FOR THE REJECTION

The reason for the obviousness rejection is stated on page 5, last paragraph, of the Office Action, and is more or less as follows: It would be obvious to modify the color simulation systems of Saita, in view of Hamburg, in view of Fertig, and further in view of Yoshio by including a "post-adjustment image window" to allow the user to adjust the degree of blending or the blending ratio by moving sliders to get the required color blending efficiently.

In applicants' claimed system of amended claim 1 only a single parameter, the mixing ratio, is input and varied in order to obtain the desired color of the hair displayed on the display area of the display section. Indeed only then can the mixing ratio, i.e. a single blending parameter, which is necessary to obtain the desired color, be efficiently determined.

In fact, Yoshio's color simulation system requires the input of at least **two** RGB parameters via sliders (pl) to select a desired or resulting color as shown in fig. 5, and the embodiment of fig. 3 requires eight color parameter adjusting buttons, because at least two of the three R, G and B values must be selected in the system of Yoshio to determine the displayed color of the thumbnail. Thus a single blending or mixing ratio is **not** input. Yoshio does not disclose that a single blending ratio is determined from the slider positions of the two sliders.

Furthermore in the color simulation system of Yoshio, as explained above, Yoshio does not teach combining two different color shades by means of the

layer system of Hamburg and specifying the degree by which they are combined, i.e. the transparency of each of the two layers, by a single mixing ratio or blending ratio parameter.

Thus the result of the combination of the cited prior art references, Saita, Fertig, Hambug, and Yoshio, as stated on page 5 of the Office Action does **not** correspond to the applicant's claimed color simulation system according to the amended claim 1.

However recent court decisions have stated that even under the stricter examination procedure under the KSR decision a sufficient reason why one skilled in the art would arrive at the invention as claimed by the applicant must be established. For example, the Board of Appeals has said:

“The Examiner has not articulated a sufficient reason why one skilled in the art would have modified [the art] and arrived at the presently claimed subject matter” *Ex Parte Penhasi*, BPAI Appeal No. 2007-2543 (Dec 13, 2007).

Only the applicant claims a system in which two colors with different RGB parameters are blended to produce a resultant color with a single RGB triplet of values by specifying a single blending or mixing ratio that determines the transparencies or fractional contributions of the two different colors to the resultant color, so that the mixing ratio corresponding to the desired color can be easily determined or adjusted by means of a single slider.

Furthermore none of the prior art references disclose the problem that the claimed color simulation system solves. This problem is expressed on page 1,

last paragraph, of applicant's originally filed system. The problem is to simulate a hair color mixing process for coloring hair in which two different hair dye compositions are mixed to provide a resultant color on the hair. The hair color simulation system is to be used during consultation with a hair styling professional who operates the system to minimize the difference between the hair color resulting from the hair color mixing procedure and the desired hair color.

This problem is not disclosed in either Saita or Fertig. The other two prior art references do not disclose anything regarding hair dyeing procedures or simulation of hair dyeing procedures. If the references do not disclose the problem, how would one of ordinary skill in the art combine them to arrive at the solution of the problem? The answer is that it would not be obvious to make the modifications of these references to arrive at the claimed color simulation system without at least some knowledge of the problem which can only be obtained from the applicant's specification.

It is especially important to remember that the statute requires that the source of the reasons for the modifications of the prior art disclosures necessary to arrive at the claimed invention cannot be the applicant's specification and that all the required disclosures and the reasons for the modifications must have been available and apparent at the time the invention was made by the inventor and cannot come from the disclosures in the applicant's specification. For example the Courts have said:

"As in all determinations under 35 U.S.C. 103, the decision-maker must bring judgment to bear. It is impermissible, however, simply to engage in a

hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selected elements from references to fill the gaps". *In re Gorman*, 18 U.S.P.Q.2d 1885 (Fed. Cir. 1991).

There is no clearly stated reasons in the Office Action that explain why one skilled in the art would modify the disclosures in the prior art references to arrive at the claimed color simulation system as it is currently claimed in the amended claim 1 with all its features and limitations, especially the input of the mixing ratio and its determination.

For the foregoing reasons withdrawal of the rejection of amended claims 1 to 5 as obvious under 35 U.S.C. 103 (a) over Saita (US '565), in view of Hamburg (US '583), in view of Fertig (US '689), and further in view of Yoshio (US '306) is respectfully requested.

IV. EUROPEAN PATENT GRANTED


A European Patent has been granted that contains the same subject matter as the above-identified U.S. Patent Application. The above-amended claims correspond closely to the claims of the European Patent EP 1 727 443 B1, a copy of which accompanies this amendment. This EP Patent is not prior art because it is based on the International Application, WO 2005/089589, filed September 29, 2005.

The European Patent was granted in a European examination procedure that considered the Saita, Fertig and Yoshio prior art patents.

Should the Examiner require or consider it advisable that the specification, claims and/or drawing be further amended or corrected in formal respects to put this case in condition for final allowance, then it is requested that such amendments or corrections be carried out by Examiner's Amendment and the case passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing the case to allowance, he or she is invited to telephone the undersigned at 1-631-549-4700.

In view of the foregoing, favorable allowance is respectfully solicited.

Respectfully submitted,


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(54) **COLOR SIMULATION SYSTEM FOR HAIR COLORING**

FARBSIMULIERSYSTEM ZUM HAARFÄRBEN

SYSTÈME DE SIMULATION DE COULEURS POUR LA COLORATION DE CHEVEUX

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Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 727 443 B1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a color simulation system for performing a simulation to check a hair color that is expected as a result of application of hair color preparations to the original hair of a client, prior to a hair coloring operation.

BACKGROUND OF THE INVENTION

[0002] In recent years, an increasing number of people enjoy having their hair colored in desired colors that coordinate with the colors of their makeup or clothes. When hair coloring is performed, however, the resultant hair color is different from the color of a hair color preparation used for the hair coloring, because the resultant color greatly depends on the general characteristics of the hair such as the thickness and hardness of the hair, and the original color of the hair before the hair coloring.

[0003] At a beauty salon, a hair stylist normally provides counseling to each client before a hair coloring operation, so as to minimize the difference between the color desired by the client and the resultant color expected from experience by the hair stylist. However, hair colors one would picture in mind are very subjective and are very hard to put into words. To counter this problem, Japanese Laid-Open Patent Publication No. 204138 of 1997 discloses a device that shows the images of estimated hair colors to a hair stylist and his/her client, so that the hair stylist can provide smooth counseling based on the estimated images.

[0004] Meanwhile, a method called "hair color mixing" has been becoming popular recently in response to various consumer demands for hair colors. According to the hair color mixing method, two different hair color preparations are mixed and then applied to hair. By this method, however, it is even more difficult to color the hair of a client as desired, than in the conventional case where only one hair color preparation is used. Therefore, it is necessary to carefully and accurately provide counseling so as to reduce the difference between the resultant color desired by the client and the resultant color expected by the hair stylist.

[0005] In the case of a hair coloring operation to be performed by the hair color mixing method, however, there has not been a suitable technique developed for providing smooth counseling to a client so as to clearly show the client the resultant hair color expected by the hair stylist.

SUMMARY OF THE INVENTION

[0006] It is, therefore, an object of the present invention to provide a means for performing an accurate hair coloring operation with mixed hair color preparations, so as to minimize the difference between the hair color desired

by a client and the resultant hair color expected by a hair stylist.

[0007] To solve the above problem, the present invention provides a color simulation system that includes: a display section; a base screen displaying section that displays a base screen on the predetermined display area of the display section, the base screen having first through fifth layers; a hair color data storage section that records the RGB value of each of original hair colors to be subjected to hair coloring; a hair color preparation data storage section that records the RGB value of each of the colors of hair color preparations; a hair line data storage section that records the image data of a hair line; a first input section that receives an input of choice of one hair color from the original hair colors recorded in the hair color data storage section; a second input section that receives an input of choice of two hair color preparations from the data of the hair color preparations recorded in the hair color preparation data storage section together with a mixing ratio between the selected hair color preparations; a first image displaying section that displays the hair line with predetermined transparency on the first layer of the base screen according to the image data recorded in the hair line data storage section; a second image displaying section that retrieves the RGB value of a selected hair color from the hair color data storage section and displays the selected hair color without transparency on the fifth layer of the base section based on the input received at the first input section; a third image displaying section that retrieves the RGB values of the selected two hair color preparations from the hair color preparation data storage section and displays the colors of the selected two hair color preparations with predetermined transparency on the third and fourth layers of the base screen, respectively based on the input received at the second input section, the predetermined transparency corresponding to the mixing ratio between the two hair color preparations; and a fourth image displaying section that retrieves the RGB value of the selected hair color from the hair color data storage section and displays the selected hair color with predetermined transparency on the second layer of the base screen based on the input received at the first input section.

[0008] In the above described structure, the base screen displayed by the base screen displaying section preferably has an intermediate layer between the first and second layers, and the color simulation system further includes a second hair line data storage section that records the image data of a second hair line which is different from the hair line recorded in the hair line data storage section in line pattern and color, and a fifth image displaying section that displays the second hair line with predetermined transparency on the intermediate layer of the base screen according to the image data recorded in the second hair line data storage section.

[0009] More preferably, the third image displaying section displays the selected two hair color preparations in the colors which are deeper than the original colors there-

of recorded in the hair color preparation data storage section by a predetermined RGB value and with the transparency corresponding to the mixing ratio between the two hair color preparations.

[0010] Also, the third image displaying section preferably displays the color of one of the selected two hair color preparations on the third layer with the transparency which is lower than the transparency determined by the mixing ratio, and the color of the other one of the selected two hair color preparations on the fourth layer with the transparency which is higher than the transparency determined by the mixing ratio.

[0011] Further, the display area of the display section is preferably the hair region on the head of a model displayed by the display section.

[0012] According to the present invention, a screen with a layered structure is prepared, and a hair line image and the original color of the hair to be subjected to hair coloring are displayed with predetermined transparency on the corresponding layers of the screen. Also, the colors of two hair color preparations to be mixed with each other are displayed with the transparency corresponding to the mixing ratio between the two hair color preparations on the corresponding layers. These layers are then superimposed on one another so as to display the image of the hair in a color with the feel that is very close to the actual resultant color of the hair subjected to the hair coloring.

[0013] In this manner, a hair coloring simulation can be performed with the system according to the present invention, while the color of hair is being monitored on the screen. Through the hair coloring simulation, the difference between the color desired by the client and the resultant color expected by the hair stylist can be made as small as possible. Thus, more accurate hair coloring can be performed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a block diagram illustrating the structure of a color simulation system according to a first embodiment of the present invention;

Fig. 2 illustrates the main screen to be displayed on the display section of the system shown in Fig. 1; and

Fig. 3 illustrates the layered structure of the screen of the system shown in Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] The following is a description of embodiments of the present invention, with reference to the accompanying drawings.

[0016] Fig. 1 is a block diagram of a color simulation system according to a first embodiment of the present invention. As shown in Fig. 1, the system according to

the present invention includes a display section 1 and a base screen displaying section 2 that displays a base screen having first through fifth layers (in this order from the top) on a predetermined display area of the display section 1.

[0017] The system according to the present invention also includes a hair color data storage section 3 in which the RGB value of each of original hair colors to be subjected to hair coloring are stored in advance, a hair color preparation data storage section 4 in which the RGB value of each of the colors of hair color preparations are stored in advance, and a hair line data storage section 5 in which the image data of a hair line are stored in advance. The image of the hair line only shows the dark regions representing the hair, and the rest of the image is transparent.

[0018] The system according to the present invention further includes a first input section 6 that receives an input of choice indicating one of the hair colors registered in the hair color data storage section 3, and a second input section 7 that receives an input of choice indicating two hair color preparations selected from the hair color preparations registered in the hair color preparation data storage section 4, together with a mixing ratio between the selected two hair color preparations.

[0019] Fig. 2 illustrates the main screen displayed on the display section 1 of the system according to the present invention. As shown in Fig. 2, a first display region 20 that is located at the lower left of the screen displays the face of a model. In this embodiment, the base screen displayed by the base screen displaying section 2 is the region in which the image of the hair 25 of the model is shown. Instead of the face of a model, for example, the image of the face of a client that is taken through a suitable image capturing device such as a digital camera, and the image of the hair of the client can be shown on the base screen.

[0020] In Fig. 2, a second display region 21 located at the center right of the screen displays a color chart 26.

The color chart 26 has a matrix-like format that includes blocks representing the respective colors registered in the hair color data storage section 3 and the hair color preparation data storage section 4. In this embodiment, the first input section 6 is formed with the color chart 26 and a suitable pointing device (not shown) such as a mouse. The block of a desired color shown on the color chart 26 is selected with the mouse, and an input of choice indicating the desired color registered in the hair color data storage section 3 is carried out.

[0021] In Fig. 2, at the lower right of the screen, a third display region 22 and a fourth display region 23 are located at a distance from each other in the horizontal direction. A slider 24 that has a scale 27 is displayed between the third display region 22 and the fourth display region 23. In this embodiment, the second input section 7 is formed with the slider 24 as well as the color chart 26 and the mouse that also constitute the first input section 6. The blocks of desired two colors on the color chart

26 are selected with the mouse, and then an input of choice indicating the two hair color preparations among the hair color preparations registered in the hair color preparation storage section 4 is carried out. The colors of the selected two hair color preparations are displayed on the third display region 22 and the fourth display region 23, respectively. Further, the slider 24 is moved with the mouse and is set in a desired position so as to carry out an input of choice indicating the mixing ratio between the selected two hair color preparations. Here, if the slider 24 is located in the middle of the scale 27, the mixing ratio between the two hair color preparations is 1 to 1. In this manner, the mixing ratio between the two hair color preparations is determined by the ratio between the lengths from the slider 24 to both ends of the scale 27.

[0022] The system according to the present invention also includes a first image displaying section 8 that displays the corresponding hair line image with predetermined transparency on the first layer of the base screen, based on the image data stored in the hair line data storage section 5. Here, the hair line image may include only one type of image. However, this embodiment is designed to three-dimensionally display each hair image on the display section 1 and give the actual feel of the hair to the hair image displayed on the screen. To do so, a second hair line image that is different from the first hair line image in line pattern and color is superimposed on the first hair line image. Therefore, the base screen displayed by the base screen displaying section 2 has an intermediate layer between the first and second layers, and the system further includes: a second hair line data storage section 12 in which the image data of the second hair line image that is different from the first hair line image in line pattern and color are stored in advance; and a fifth image displaying section 13 that displays the corresponding second hair line image with predetermined transparency on the intermediate layer of the base screen, based on the image data stored in the second hair line data storage section 12.

[0023] In this case, the hair line image and the transparency of the color to be displayed on each layer are empirically determined by the values representing the optimum display image. Such values are obtained through a test run of the system and monitoring of the screen displayed on the display section 1.

[0024] The system according to the present invention further includes: a second image displaying section 9 that retrieves the RGB value of the selected hair color from the hair color data storage section 3, based on the input received at the first input section 6, and displays the selected hair color without transparency on the fifth layer of the base screen; a third image displaying section 10 that retrieves the RGB values of the selected two hair color preparations from the hair color preparation data storage section 4, based on the input received at the second input section 7, and displays the colors of the selected hair color preparations on the third and fourth layers of the base screen, respectively, with the trans-

parency corresponding to the mixing ratio between the selected hair color preparations; and a fourth image displaying section 11 that retrieves the RGB value of the selected hair color from the hair color data storage section 3, based on the input received at the first input section 6, and displays the selected hair color with predetermined transparency on the second layer of the base screen.

[0025] Fig. 3 illustrates the layered screen displaying process to be carried out by the system according to the present invention. For ease of explanation, the base screen shown in Fig. 3 has the shape of a trapezoid, instead of the shape of the hair line. In Fig. 3, reference numeral 30 indicates the first layer of the base screen, reference numeral 31 indicates the intermediate layer, and reference numerals 32 through 35 indicate the second through fifth layers.

[0026] Referring to Fig. 3, the operation of the system according to the present invention is now described briefly. First, the original color of the hair is input to the first input section 6. The first image displaying section 8 then displays the hair line image with the predetermined transparency on the first layer 30. The fifth image displaying section 13 displays the second hair line image with the predetermined transparency on the intermediate layer 31. The second image displaying section 9 displays the selected hair color without transparency on the fifth layer 35. These layers 30, 31, and 35 are then superimposed on one another so as to display the image of the hair in the original hair color on the base screen.

[0027] Next, the colors of the two hair color preparations and the mixing ratio between the two hair color preparations are input to the second input section 7. The third image displaying section 10 then displays the colors of the selected hair color preparations with the predetermined transparency on the third layer 33 and the fourth layer 34, respectively, and the fourth image displaying section 11 displays the selected hair color with the predetermined transparency on the second layer 32. All the layers 30 through 35 are then superimposed on one another so as to display the image of the hair in the resultant color of mixing the two hair color preparations on the base screen. Here, the same hair color as the color displayed on the fifth layer 35 is displayed on the second layer 32 and superimposed on the other colors with the predetermined transparency displayed on the other layers, so that a hair color 36 that is very similar to the actual resultant hair color is displayed.

[0028] Since the layers (the first layer 30 and the intermediate layer 31), on which the first hair line image and the second hair line image are displayed, are located (on the front side of the display) over the layers (the third layer 33 and the fourth layer 34) on which the colors of the hair color preparations are displayed, the color of the hair displayed on the display section 1 as a result of the superimposition of the layers is more whitish than the actual resultant color. To prevent this problem, the third image displaying section 10 preferably replaces the RGB values representing the colors of the selected two hair

color preparations with RGB values that represent darker colors than the original colors of the selected two hair color preparations by predetermined values. By doing so, the colors of the selected two hair color preparations are displayed with the transparency corresponding to the selected mixing ratio on the third and fourth layers 33 and 34, respectively.

[0029] The replacing RGB values that represent darker colors than the original colors of the selected hair color preparations are determined so that an optimum display image can be obtained, through a test run of the system and monitoring of the screen displayed on the display section 1.

[0030] Also, since the third layer 33 is located over the fourth layer 34 (or on the front side of the fourth layer 34 on the display), the color displayed on the display section 1 as a result of the superimposition of the layers is slightly different from the actual resultant color obtained by mixing the two hair color preparations, with the transparency corresponding to the mixing ratio received at the second input section 7. Therefore, to display a color that approximates to the actual resultant mixed color, the third image displaying section 10 preferably changes the value of the transparency of the color of the hair color preparation to be displayed on the third layer 33 to a lower value, by a predetermined amount, than the value of the transparency determined by the mixing ratio between the selected two hair color preparations. The third image displaying section 10 also preferably changes the value of the transparency of the color of the hair color preparation to be displayed on the fourth layer 34 to a higher value, by a predetermined amount, than the value of the transparency determined by the mixing ratio between the selected two hair color preparations. The third image displaying section 10 then displays the colors of the selected two hair color preparations with the changed transparency on the third and fourth layers 33 and 34, respectively.

[0031] The predetermined amount by which the transparency is changed is empirically determined by the values representing an optimum display image that can be obtained through a test run of the system and monitoring of the screen displayed on the display section 1.

[0032] In the above described manner, the color simulation system according to the present invention forms a screen with a layered structure. In this system, the hair line image and the original color of hair to be subjected to hair coloring are displayed with predetermined transparency on the corresponding layers. The colors of two hair color preparations to be mixed with each other are also displayed with the transparency corresponding to the mixing ratio between the two hair color preparations on the corresponding layers. Those layers are superimposed on one another so as to display the image of the hair in a color with the feel that is very similar to the actual resultant color of the hair subjected to the hair coloring.

Claims

1. A color simulation system comprising:

- 5 a display section (1);
- a base screen displaying section (2) displaying a base screen on the predetermined display area of the display section, the base screen having first through fifth layers;
- 10 a hair color data storage section (3) recording RGB values of each of original hair colors to be subjected to hair coloring;
- a hair color preparation data storage section (4) recording RGB values of each of colors of hair color preparations;
- 15 a hair line data storage section (5) recording image data of hair line;
- a first input section (6) for receiving an input of choice of one hair color from the original hair colors recorded in the hair color data storage section;
- 20 a second input section (7) for receiving an input of choice of two hair color preparations from the hair color preparations recorded in the hair color preparation data storage section together with mixing ratio of the selected hair color preparations;
- 25 a first image displaying section (8) displaying the hair line with the predetermined transparency on the first layer of the base screen according to the image data recorded in the hair line data storage section;
- 30 a second image displaying section (9) retrieving the RGB value of the selected hair color from the hair color data storage section and displaying the selected hair color without transparency on the fifth layer of the base screen based on the input received at the first input section;
- 35 a third image displaying section (10) retrieving the RGB values of the selected two hair color preparations from the hair color preparation data storage section and displaying the colors of the selected two hair color preparations with the transparency corresponding to the selected mixing ratio thereof on the third and fourth layers of the base screen, respectively based on the input received at the second input section; and
- 40 a fourth image displaying section (11) retrieving the RGB value of the selected hair color from the hair color data storage section and displaying the selected hair color with the predetermined transparency on the second layer of the base screen based on the input received at the first input section.
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- ### 2. The color simulation system according to claim 1, wherein the base screen displayed by the base screen displaying section (2) has an intermediate

layer between the first and second layers, and the color simulation system further comprises a second hair line data storage section recording image data of second hair line which is different from the hair line recorded in the hair line data storage section in line pattern and color, and a fifth image data displaying section displaying the second hair line with the predetermined transparency on the intermediate layer of the base screen according to the image data recorded in the second hair line data storage section.

3. The color simulation system according to claim 2, wherein the third image displaying section (10) displays the selected two hair color preparations with the colors which are deeper than the original colors thereof recorded in the hair color preparation data storage section by the predetermined RGB value and with the transparency corresponding to the selected mixing ratio thereof.
4. The color simulation system according to any one of claims 1 through 3, wherein the third image displaying section (10) displays the color one of the selected two hair color preparations on the third layer with the transparency which is lower than the transparency determined by the selected mixing ratio and the color of the other of the selected two hair color preparations on the fourth layer with the transparency which is higher than the transparency determined by the selected mixing ratio.
5. The color simulation system according to any one of claims 1 through 4, wherein the display area of the display section (1) is a hair of head of a model's face displayed by the display section.

Patentansprüche

1. Farbsimulationssystem, mit:

einem Anzeigeabschnitt (1);
 einem Basisbildschirm-Anzeigeabschnitt (2),
 der einen Basisbildschirm auf dem vorbestimmten Anzeigebereich des Anzeigebildschirms anzeigt, wobei der Basisbildschirm eine erste bis fünfte Ebene aufweist;
 einem Haarfarbdaten-Speicherabschnitt (3),
 der RGB-Werte von jeder von ursprünglichen Haarfarben, die einer Haarfärbung unterzogen werden sollen, aufzeichnet;
 einem Haarfarbzubereitungsdaten-Speicherabschnitt (4), der RGB-Werte von jeder der Farben von Haarfarbzubereitungen aufzeichnet;
 einem Haarliniendaten-Speicherabschnitt (5),
 der Bilddaten einer Haarlinie aufzeichnet;
 einem ersten Eingabeabschnitt (6) zum Empfangen einer Eingabe der Wahl einer Haarfarbe

aus den ursprünglichen Haarfarben, die im Haarfarbdaten-Speicherabschnitt aufgezeichnet sind;

einem zweiten Eingabeabschnitt (7) zum Empfangen einer Eingabe der Wahl von zwei Haarfarbzubereitungen aus den Haarfarbzubereitungen, die im Haarfarbzubereitungsdaten-Speicherabschnitt aufgezeichnet sind, zusammen mit einem Mischverhältnis der ausgewählten Haarfarbzubereitungen;

einem ersten Bildanzeigebereich (8), der die Haarlinie mit der vorbestimmten Transparenz auf der ersten Ebene des Basisbildschirms gemäß den im Haarliniendaten-Speicherabschnitt aufgezeichneten Bilddaten anzeigt;

einem zweiten Bildanzeigebereich (9), der den RGB-Wert der ausgewählten Haarfarbe aus dem Haarfarbdaten-Speicherabschnitt abrufen und die ausgewählte Haarfarbe ohne Transparenz auf der fünften Ebene des Basisbildschirms auf der Basis der am ersten Eingabeabschnitt empfangenen Eingabe anzeigt;

einem dritten Bildanzeigebereich (10), der die RGB-Werte der ausgewählten zwei Haarfarbzubereitungen aus dem Haarfarbzubereitungsdaten-Speicherabschnitt abrufen und die Farben der ausgewählten zwei Haarfarbzubereitungen mit der Transparenz, die dem ausgewählten Mischverhältnis davon entspricht, auf der dritten bzw. der vierten Ebene des Basisbildschirms auf der Basis der am zweiten Eingabeabschnitt empfangenen Eingabe anzeigt; und

einem vierten Bildanzeigebereich (11), der den RGB-Wert der ausgewählten Haarfarbe aus dem Haarfarbdaten-Speicherabschnitt abrufen und die ausgewählte Haarfarbe mit der vorbestimmten Transparenz auf der zweiten Ebene des Basisbildschirms auf der Basis der am ersten Eingabeabschnitt empfangenen Eingabe anzeigt.

2. Farbsimulationssystem nach Anspruch 1, wobei der durch den Basisbildschirm-Anzeigeabschnitt (2) angezeigte Basisbildschirm eine Zwischenebene zwischen der ersten und der zweiten Ebene aufweist und das Farbsimulationssystem ferner einen zweiten Haarliniendaten-Speicherabschnitt, der Bilddaten einer zweiten Haarlinie, die von der im Haarliniendaten-Speicherabschnitt aufgezeichneten Haarlinie im Linienmuster und in der Farbe verschieden ist, aufzeichnet, und einen fünften Bildanzeigebereich, der die zweite Haarlinie mit der vorbestimmten Transparenz auf der Zwischenebene des Basisbildschirms gemäß den im zweiten Haarliniendaten-Speicherabschnitt aufgezeichneten Bilddaten anzeigt, umfasst.

3. Farbsimulationssystem nach Anspruch 2, wobei der

dritte Bildanzeigebereich (10) die ausgewählten
 zwei Haarfarbzubereitungen mit den Farben, die um
 den vorbestimmten RGB-Wert tiefer sind als die ur-
 sprünglichen Farben davon, die im Haarfarbzube-
 reitungsdaten-Speicherabschnitt aufgezeichnet
 sind, und mit der dem ausgewählten Mischverhältnis
 davon entsprechenden Transparenz anzeigt.

4. Farbsimulationssystem nach einem der Ansprüche
 1 bis 3, wobei der Bildanzeigebereich (10) die Far-
 be von einer der ausgewählten zwei Haarfarbzube-
 reitungen auf der dritten Ebene mit der Transparenz,
 die niedriger ist als die durch das ausgewählte
 Mischverhältnis bestimmte Transparenz, und die
 Farbe der anderen der ausgewählten zwei Haarfarb-
 zubereitungen auf der vierten Ebene mit der Trans-
 parenz, die höher ist als die durch das ausgewählte
 Mischverhältnis bestimmte Transparenz, anzeigt.

5. Farbsimulationssystem nach einem der Ansprüche
 1 bis 4, wobei der Anzeigebereich des Anzeigeb-
 ereichs (1) Kopfhair eines Gesichts eines Modells,
 das durch den Anzeigebereich angezeigt wird, ist.

Revendications

1. Système de simulation de couleurs, comprenant:

une section d'affichage (1);
 une section d'affichage d'écran de base (2) qui
 affiche un écran de base sur la zone d'affichage
 prédéterminée de la section d'affichage, l'écran
 de base comprenant une première à une cin-
 quième couches;
 une section de stockage de données de couleur
 de cheveux (3) qui enregistre des valeurs RVB
 de chacune des couleurs de cheveux originales
 à soumettre à la coloration des cheveux;
 une section de stockage de données de prépa-
 ration de couleur de cheveux (4) qui enregistre
 des valeurs RVB (Rouge - Vert - Bleu) de cha-
 cune des couleurs des préparations de couleur
 de cheveux;
 une section de stockage de données de contour
 des cheveux (5) qui enregistre des données
 d'image de contour des cheveux;
 une première section d'entrée (6) destinée à re-
 cevoir une entrée au choix d'une couleur de che-
 veux parmi les couleurs de cheveux originales
 enregistrées dans la section de stockage de
 données de couleur de cheveux;
 une deuxième section d'entrée (7) destinée à
 recevoir une entrée au choix de deux prépara-
 tions de couleur de cheveux parmi les prépara-
 tions de couleur de cheveux enregistrées dans
 la section de stockage de données de prépara-
 tion de couleur de cheveux conjointement avec

un rapport de mélange des préparations de cou-
 leur de cheveux sélectionnées;
 une première section d'affichage d'image (8) qui
 affiche le contour des cheveux avec la transpa-
 rence prédéterminée sur la première couche de
 l'écran de base sur la base des données d'image
 enregistrées dans la section de stockage de
 données de contour des cheveux;
 une deuxième section d'affichage d'image (9)
 qui récupère la valeur RVB de la couleur de che-
 veux sélectionnée à partir de la section de stoc-
 kage de données de couleur de cheveux, et qui
 affiche la couleur de cheveux sélectionnée sans
 transparence sur la cinquième couche de
 l'écran de base sur la base de l'entrée reçue à
 la première section d'entrée;
 une troisième section d'affichage d'image (10)
 qui récupère les valeurs RVB des deux prépa-
 rations de couleur de cheveux sélectionnées à
 partir de la section de stockage de données de
 préparation de couleur de cheveux, et qui affiche
 les couleurs des deux préparations de couleur
 de cheveux sélectionnées avec la transparence
 qui correspond au rapport de mélange sélec-
 tionné de celles-ci sur les troisième et quatrième
 couches de l'écran de base, respectivement, sur
 la base de l'entrée reçue à la deuxième section
 d'entrée; et
 une quatrième section d'affichage d'image (11)
 qui récupère la valeur RVB de la couleur de che-
 veux sélectionnée à partir de la section de stoc-
 kage de données de couleur de cheveux, et qui
 affiche la couleur de cheveux sélectionnée avec
 la transparence prédéterminée sur la deuxième
 couche de l'écran de base sur la base de l'entrée
 reçue à la première section d'entrée.

2. Système de simulation de couleurs selon la reven-
 dication 1, dans lequel l'écran de base affiché par la
 section d'affichage d'écran de base (2) comprend
 une couche intermédiaire entre les première et
 deuxième couches, et le système de simulation de
 couleurs comprend en outre une deuxième section
 de stockage de données de contour des cheveux
 qui enregistre des données d'image du deuxième
 contour des cheveux qui est différent du premier con-
 tour des cheveux enregistré dans la section de stoc-
 kage de données de contour des cheveux sur le plan
 du motif de contour et des couleurs, et une cinquième
 section d'affichage de données d'image qui affiche
 le deuxième contour des cheveux avec la transpa-
 rence prédéterminée sur la couche intermédiaire de
 l'écran de base en fonction des données d'image
 enregistrées dans la deuxième section de stockage
 de données de contour des cheveux.
3. Système de simulation de couleurs selon la reven-
 dication 2, dans lequel la troisième section d'afficha-

ge d'image (10) affiche les deux préparations de couleur de cheveux sélectionnées avec les couleurs qui sont plus foncées que les couleurs originales de celles-ci enregistrées dans la section de stockage de données de préparation de couleur de cheveux par la valeur RVB prédéterminée et avec la transparence qui correspond au rapport de mélange sélectionné de celles-ci.

4. Système de simulation de couleurs selon l'une quelconque des revendications 1 à 3, dans lequel la troisième section d'affichage d'image (10) affiche la couleur de l'une des deux préparations de couleur de cheveux sélectionnées sur la troisième couche avec la transparence qui est inférieure à la transparence déterminée par le rapport de mélange sélectionné, et la couleur de l'autre des deux préparations de couleur de cheveux sélectionnées sur la quatrième couche avec la transparence qui est supérieure à la transparence déterminée par le rapport de mélange sélectionné.
5. Système de simulation de couleurs selon l'une quelconque des revendications 1 à 4, dans lequel la zone d'affichage de la section d'affichage (1) est la chevelure recouvrant la tête d'un modèle dont le visage est affiché par la section d'affichage.

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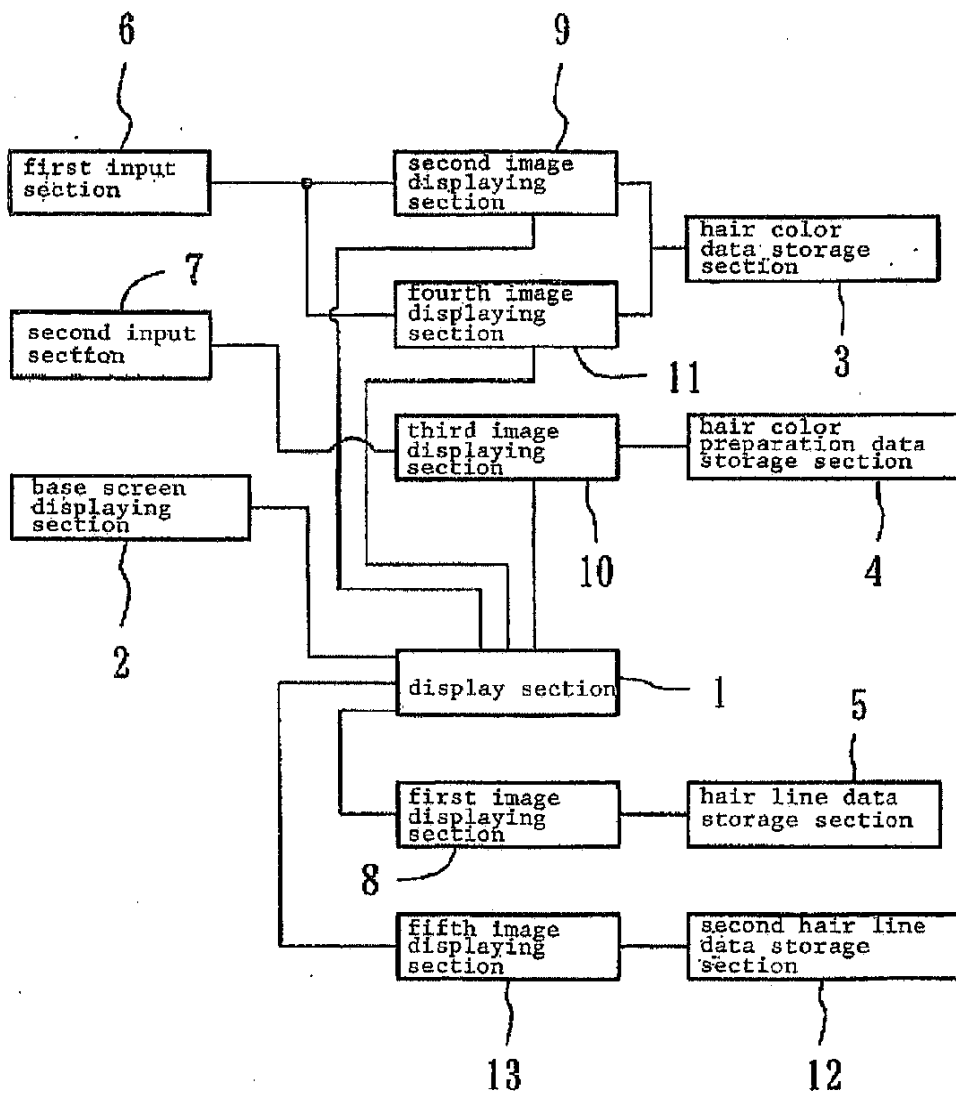
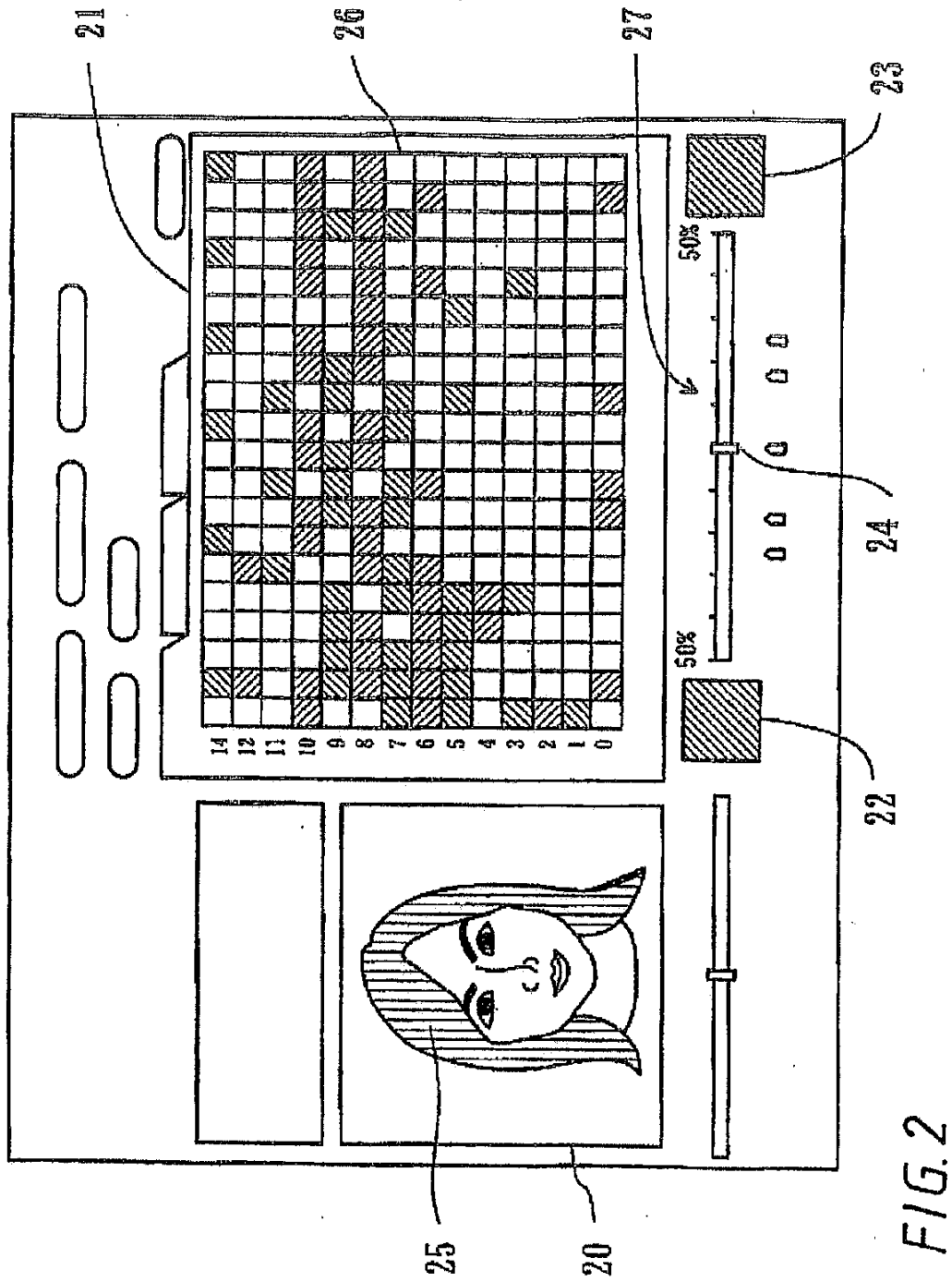
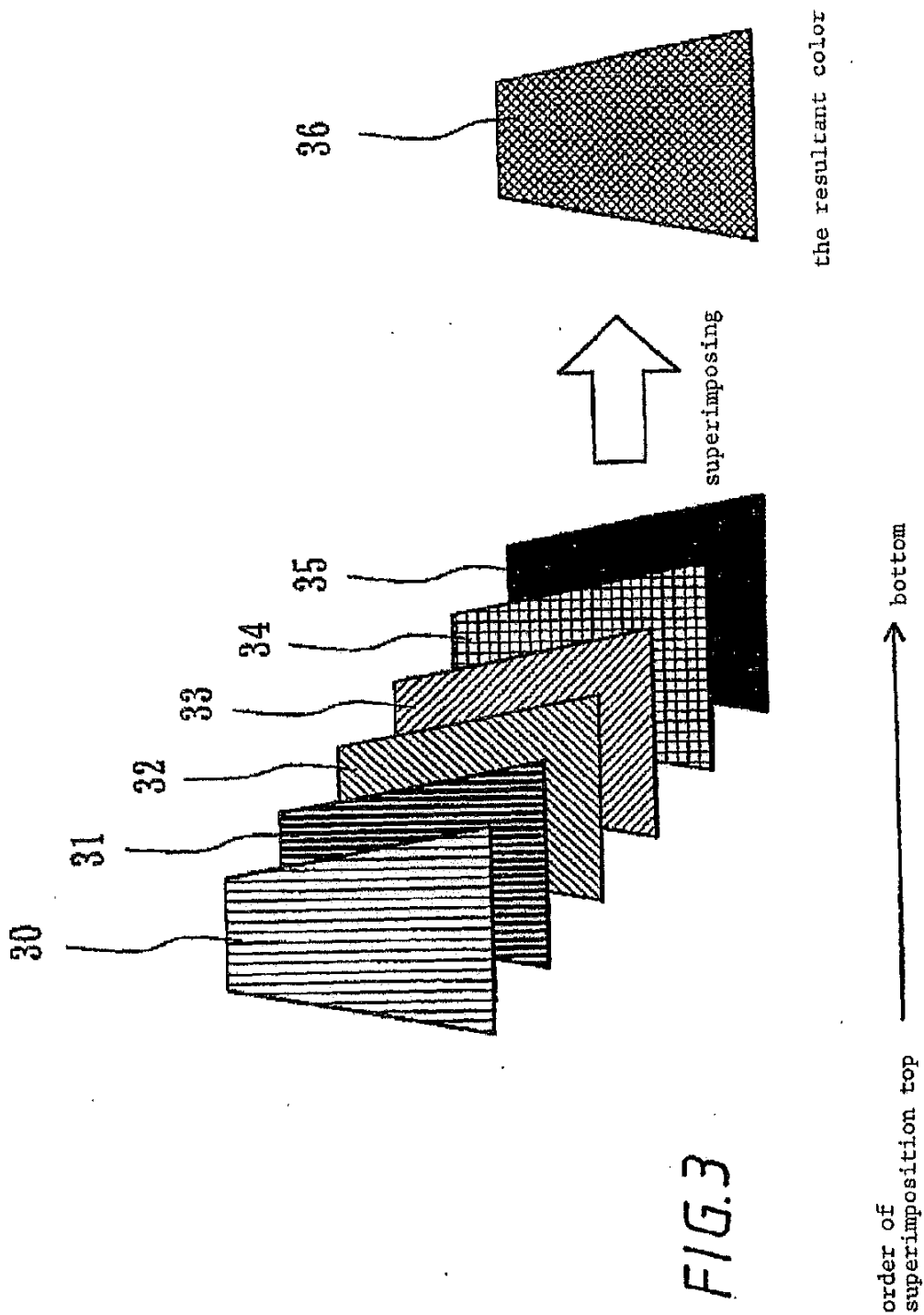


FIG. 1





REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 204138 A [0003]